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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 10/002,576 | 10/26/2001 | Changmin Chun | ECB-0115 | 4233 |

27810 7590 12/09/2002

EXXONMOBIL RESEARCH AND ENGINEERING COMPANY
P.O. BOX 900
1545 ROUTE 22 EAST
ANNANDALE, NJ 08801-0900

EXAMINER

WILKINS III, HARRY D

| ART UNIT | PAPER NUMBER |
|----------|--------------|
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1742

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DATE MAILED: 12/09/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/002,576

Applicant(s)

CHUN ET AL.

Examiner

Harry D Wilkins, III

Art Unit

1742

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-8 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-8 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 October 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____.
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ramanarayanan et al (US 5,869,195) in view of Applicant's admission of prior art and Garg et al (US 6,287,393).

Ramanarayanan et al teach a method where a pearlitic surface layer is formed on a steel article. Ramanarayanan et al teach (see col 2, line 66 to col 3, line 12) that a surface layer of at least 1 micron is transformed by conventional carburizing methods. The method includes (equivalent to (c) of present invention) slow cooling from the carburizing treatment in order to form the pearlite microstructure.

Ramanarayanan et al do not teach the claimed method of carburizing of (a) heating to the austenite region and (b) exposing to a supersaturated carbon environment at 727-900°C.

Garg et al teach (see col 5, lines 24-46) a method of carburizing steel that includes (a) heating at 750-950°C and (b) exposing the steel to a carburizing atmosphere. The atmosphere should be supersaturated, with thermodynamic activity of carbon greater than one, in order to facilitate the carbon transfer.

Therefore, it would have been obvious to one of ordinary skill in the art to have performed the conventional heating and carburizing steps as taught by Garg et al as the carburizing treatment of Ramanarayanan et al because the CO/H₂/N₂ environment of Garg et al is effective at quickly facilitating carbon transfer to the steel (see Garg et al at col 7, lines 5-24).

Ramanarayanan et al further teach that an FeS surface layer is formed on top of the pearlite layer in order to add corrosion resistance to acids. However, Applicant admits as prior art (see paragraph 3) that pearlite was known to be resistant to corrosion by organic acids. Therefore, the FeS layer of Ramanarayanan et al is not needed as the pearlite layer provides sufficient corrosion resistance.

Regarding claim 2, Ramanarayanan et al teach (see col 2, lines 49-52) that preferred steels include 0.6-0.9 wt% Mn and 0.1-0.5 wt% Si.

Regarding claims 3-5 and 8, Garg et al teach (see col 7, lines 5-24) that the carburizing atmosphere contains CO and H₂ mixed with N₂ (inert). The preferred ratio is 1:1 CO:H₂ (i.e.-50% CO, 50% H₂). Therefore, it would have been obvious to perform the carburizing with such an atmosphere because it produces quick transfer of carbon to the steel.

Regarding claim 6, it would have been within the expected skill of a routineer in the art to have optimized the time of treatment in order to adjust the depth of the carburized layer that forms pearlite upon slow cooling (for support that treatment time affects carburized depth, see Kerridge at col 3, lines 22-27).

Regarding claim 7, Ramanarayanan et al teach (see col 1, lines 41-42) that the thickness of the pearlitic region is preferably at least 20 microns.

3. Claims 1, 2 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawato et al (JP 02-185960).

Kawato et al teach (see English abstract) a method where a pearlitic surface layer is formed on a steel article. Kawato et al teach (see figure 1) that the steel is (a) heated to 925°C, (b) exposed to a carburizing atmosphere, and then (c) slowly cooled.

Kawato et al fails to meet the claimed range of temperature of the carburizing treatment. However, the claimed range of temperature would have been obvious to one of ordinary skill in the art because the prior art range is close enough, e.g.- 900°C vs. 925°C that it would have been expected to have the same properties, see MPEP 2144.05. Applicant has shown (see Figure 4) that at 950°C a continuous pearlite layer cannot be formed, however, as Kawato et al is closer than the closest comparative example, one of ordinary skill in the art would have expected the method to produce the same properties as claimed. Applicant can overcome this rejection by demonstrating, through comparative data, that carburizing at a temperature of 925°C does not produce the continuous surface pearlite layer as claimed.

Regarding claim 2, Kawato et al teach (see page 3, right col) that a preferred steel includes 0.3 wt% Mn and 0.2 wt% Si.

Regarding claim 6, it would have been within the expected skill of a routineer in the art to have optimized the time of treatment in order to adjust the depth of the carburized layer that forms pearlite upon slow cooling.

Conclusion

4. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- a. Naito et al (US 4,202,710) and Murai (JP 05-059427, JP 05-059527 and JP 04-337024) each teach a "pre-carburizing step" where a steel is carburized and then slowly cooled to form a pearlite structure, however, the carburizing treatment is done at a low carbon potential (i.e.-below the supersaturation point);
- b. Kerridge (US 4,461,655) teaches a process of carburizing a steel that causes pearlite to be formed without a slow cooling step (see col 3, lines 22-33); and,
- c. Suzuki et al (JP 03-044414) teach a process of forming a pearlite surface layer, however the carburizing occurs at 1000-1250°C which, as Applicant discloses, is unable to produce a continuous pearlite layer (see Figure 4).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Harry D Wilkins, III whose telephone number is 703-305-9927. The examiner can normally be reached on M-Th 6:00am-4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy V King can be reached on 703-308-1146. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Art Unit: 1742

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Harry D Wilkins, III
Examiner
Art Unit 1742

hdw
December 5, 2002

ROY KING 
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700